

An Update on the Northeast / Mid-Atlantic Low-Carbon Fuel Standard Initiative

For the Granite State Clean Cities Coalition

June 18, 2010

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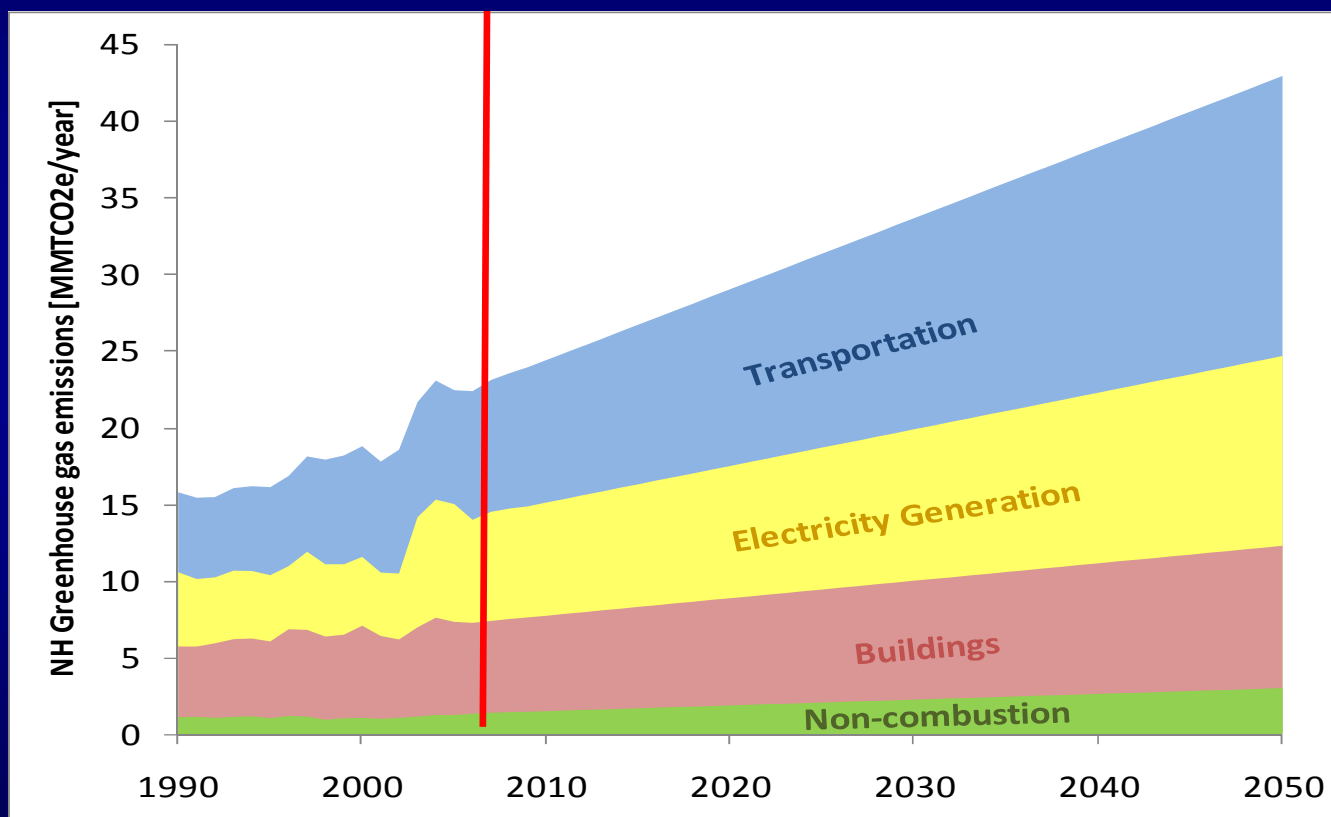
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Agenda

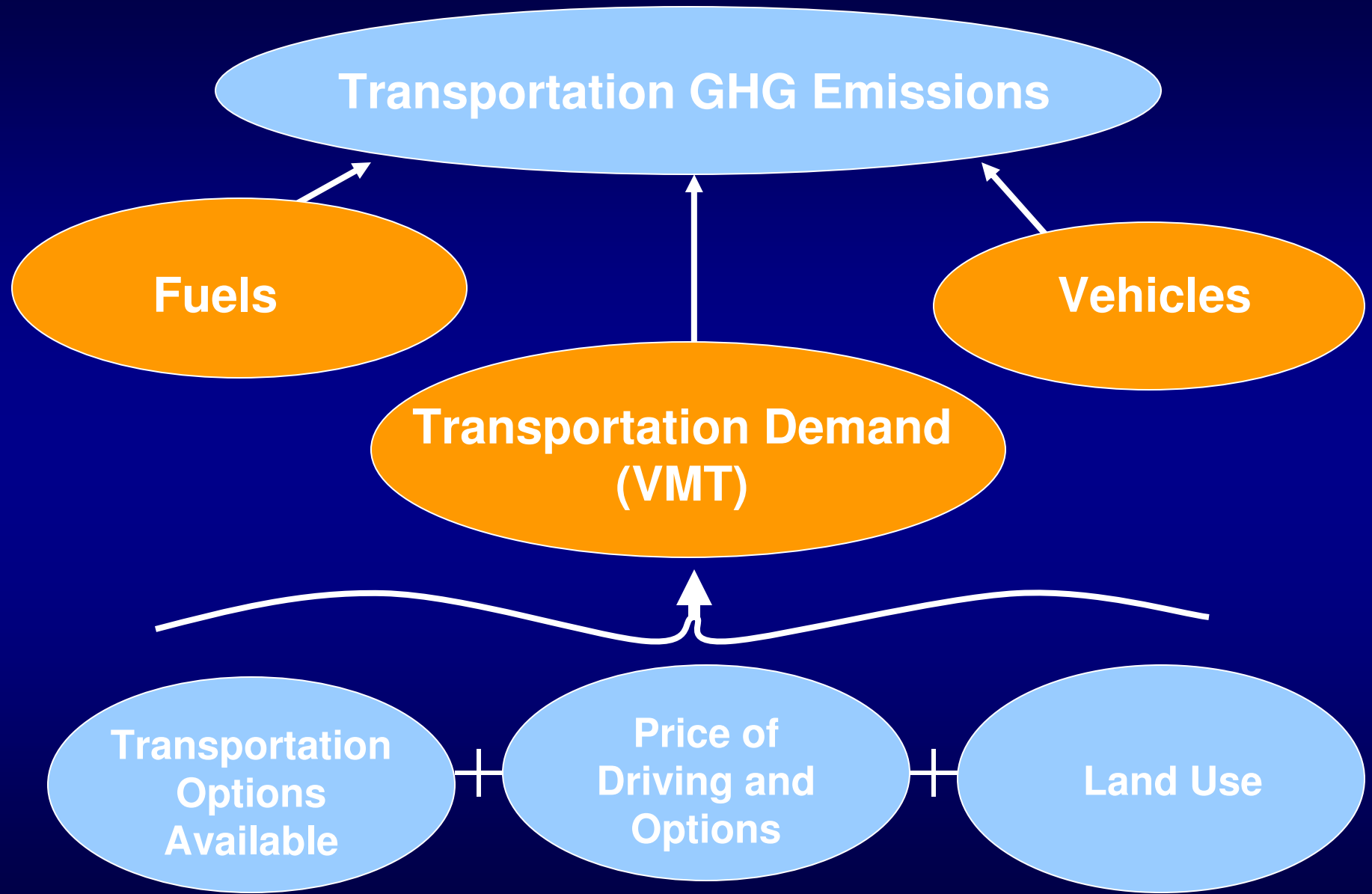
- Why is a Low Carbon Fuel Standard under consideration?
- What is a Low Carbon Fuel Standard?
- Regional Issues
- Economic Development Potential
- Current Status
- Stakeholder involvement opportunities
- Next Steps

Greenhouse Gas Emissions Projections



Historical data from EPA

Business as Usual (BAU) estimates from CSNE



NH's Climate Action Plan

- Released March 25, 2009
- Included several proposed actions to address transportation emissions
- TLU 1.C.1 – Adopt a Low Carbon Fuel Standard
- TLU 1.C.2 – Promote Advanced Technology Vehicles and Supporting Infrastructure

What is a Low Carbon Fuel Standard?

- Performance-based standard for fuels
- Does not “pick winners” or ban any fuel, but allows the market economy to respond
- Regulates “carbon intensity” or *lifecycle* GHG emissions from fuels
- Requires displacement of conventional fuels (gasoline and diesel) with lower-carbon substitutes
- Heating oil could be included
- Potential economic development opportunity – green jobs

Northeast/Mid-Atlantic LCFS Initiative

Connecticut

Delaware

Maine

Maryland

Massachusetts

New Hampshire

New Jersey

New York

Pennsylvania

Rhode Island

Vermont

Northeast/Mid-Atlantic LCFS Initiative

- June 2008 invitation from MA Gov. Patrick to state environmental commissioners to join the effort
- December 2008 Letter of Intent signed by commissioners
- 2009 Work:
 - Steering Committee
 - 6 Working Groups
 - Stakeholder Input
- December 2009 Memorandum of Understanding signed by the 11 state Governors

Memorandum of Understanding

- evaluate a regional LCFS that will reduce the average CI of transportation fuels and potentially heating fuels used in the region
- work to develop a program framework by early 2011 that addresses key program elements
- develop an economic analysis of various program options
- use best available science in a full fuel cycle analysis, including indirect emissions and sustainability issues
- include opportunity for stakeholder involvement
- collaborate with other state and regional programs

What isn't a LCFS?

- It's NOT a cap on transportation emissions.
- It's NOT a tailpipe emission standard.
- Under an LCFS transportation emissions may continue to grow if total energy used increases.
- An LCFS is designed to compliment vehicle efficiency standards and travel demand management strategies.

Program Structure: Who would be regulated?

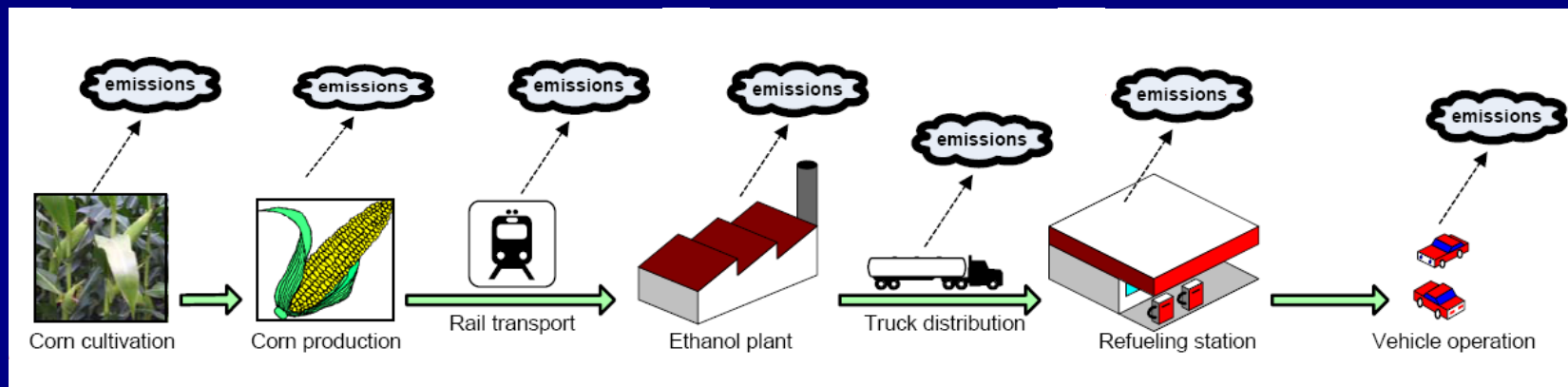
- Providers of petroleum fuels would be 'regulated parties'
- Providers of fuels that meet the LCFS standard levels would 'opt in' to earn credits:
 - Electricity
 - Hydrogen
 - Natural Gas

Flexible, Market-Driven Compliance Options

- Supply a mix of fuels with carbon intensity equal to the standard
- Provide fuels that have lower carbon intensity than the standard
- Use purchased or banked credits to meet the standard

What is “carbon intensity”?

- A measure of the total CO₂-equivalent emissions produced throughout a fuel's lifecycle



(Source: Guihua Wang and Mark Delucchi, 2005. "Pathway Diagrams". Appendix X to the Report "A Lifecycle Emissions Model (LEM): Lifecycle Emissions from Transportation Fuels, Motor Vehicles, Transportation Modes, Electricity Use, Heating and Cooking Fuels, and Materials."
<http://www.its.ucdavis.edu/publications/2003/UCD-ITS-RR-03-17X.pdf>)

- Measured in grams of CO₂-equivalent GHG emissions per unit of energy in fuel

gCO₂e/MJ

Carbon Intensity Calculation: Conventional Gasoline

Well-To-Tank Carbon Intensity: **16.9** gCO₂e/MJ

+ Carbon Content of Fuel: **72.9** gCO₂e/MJ

+ Vehicle emissions of CH₄ and N₂O: **2.47** gCO₂e/MJ

= Lifecycle Carbon Intensity: **92.3** gCO₂e/MJ

CI Values for Selected Fuel Pathways (Draft Results):

Pathway	Carbon Intensity* (gCO ₂ e/MJ)
Conventional Gasoline	92.7
Reformulated gasoline blendstock (RBOB)	96.7
Oilsand RBOB	107
Ultra-Low-Sulfur Diesel (ULSD)	93
Oilsand ULSD	104
Denatured Corn Ethanol	72.5 *
Soy Biodiesel	35 *
Forest Residue EtOH: (Fermentation)	1.8
Forest Residue EtOH: (Gasification)	15

* Does not include effects of indirect land-use change

CI Values for Selected Fuel Pathways (Draft Results):

Pathway	Carbon Intensity (gCO ₂ e/MJ)
Compressed Natural Gas	73.1
Liquefied Petroleum Gas (LPG)	86.9
Heating Pellets from woody biomass	19.8
Electricity for EVs (100% NG)	60.3 *
Electricity for EVs (100% Coal)	115 *
Electricity for EVs (100% Wind)	0
Average Northeast Electricity (2005)	45

**Values adjusted for end-use efficiency.*

Average Fuel Carbon Intensity (AFCI)

- Measure of compliance for regulated parties
- *Weighted average* of the CI values of every fuel sold
- Example:
 - 100 MJ of gasoline at 95 g/MJ
 - 20 MJ of low-C substitute at 50 g/MJ

$$\bullet \text{AFCI} = \frac{(100 \times 95) + (20 \times 50)}{100 + 20} = 88 \text{ g/MJ}$$

Similarities to Other State Programs

Methodology

- ✓ General program structure (where practical)
- ✓ GREET model for assessment of “traditional” lifecycle impacts
- ✓ Account for indirect land-use change

Scope

- ✓ All transportation fuels
- ? Heating oil
- ? Other heating fuels...

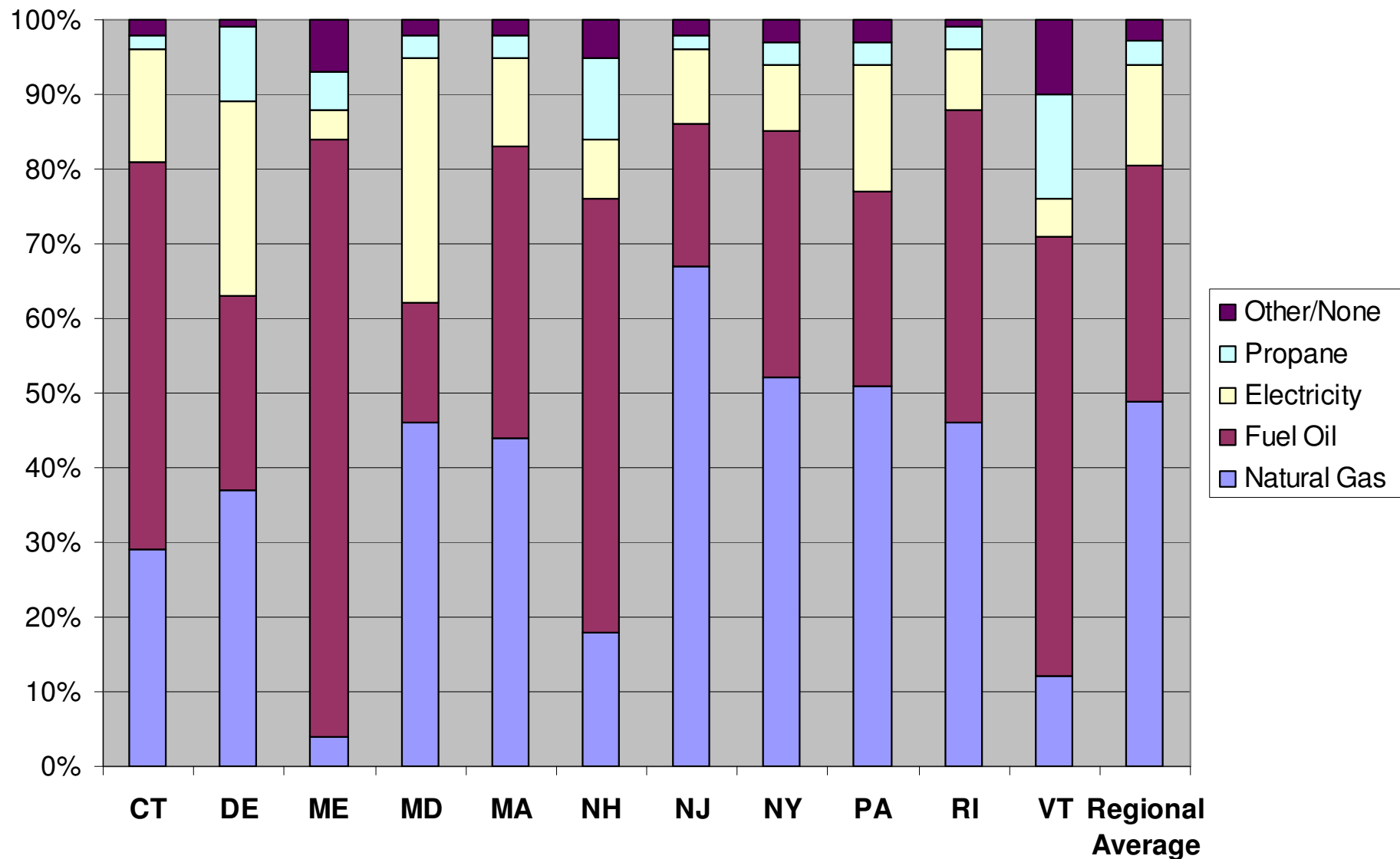
Stringency

- ? CARB’s reduction target is 10% by 2020 and other programs evaluating similar targets.
- ? Regionally consistent stringency is preferred
 - Interconnected fuel supply network
 - Facilitate compliance for regulated parties
 - Maximize program effectiveness

Issues Unique to Region

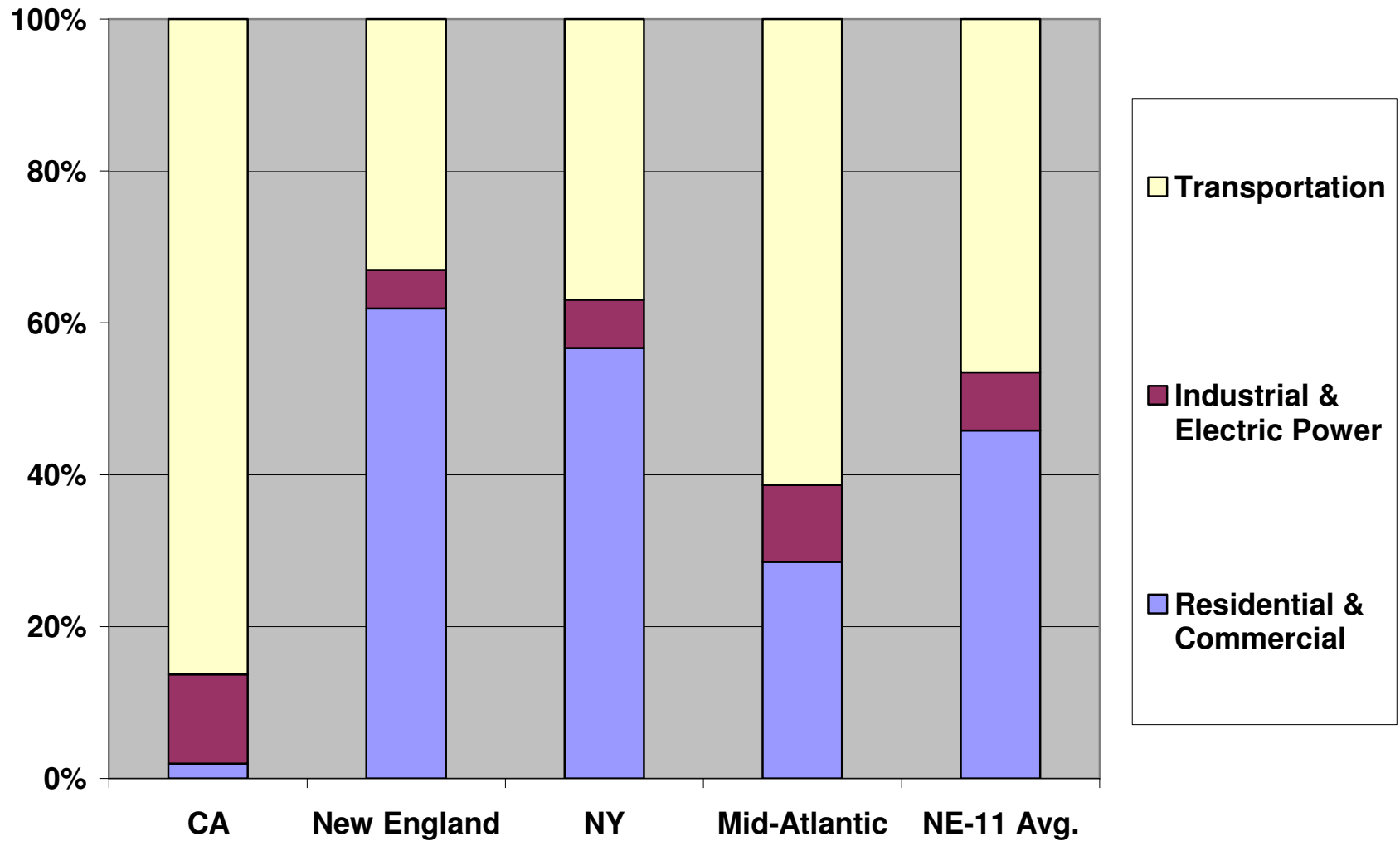
- ***Our region uses as much fuel for space heating as for transportation.***
 - Represents ~50% regional distillate demand
- ***Point of regulation***
 - Most transportation fuel imported to region as finished product
- ***Compliance & Enforcement***
 - 11 states = 11 enforcement authorities
 - Regional credit pool might be desirable
- ***Default CI Values***
 - Lookup table must be specific to region
 - Could include pathways not considered in CA

Home Heating Technologies, 2000 (Share of Households)



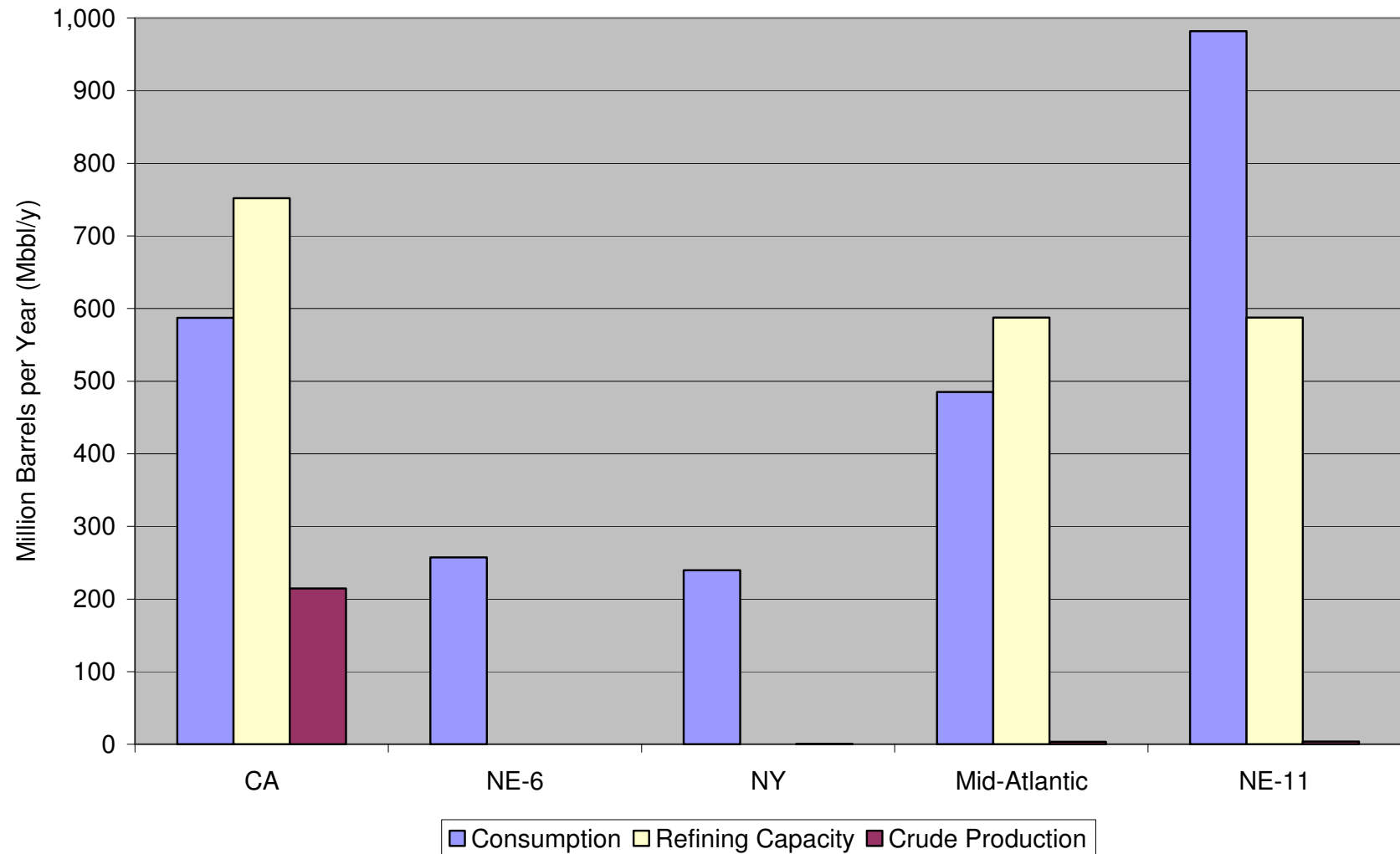
Source data: Energy Information Administration, *State Energy Profiles*.
http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=US

Distillate Oil Consumption, 2007



Source data: EIA, State Energy Data System

2008 Petroleum Consumption, Refining Capacity and Crude Oil Production



Source data: EIA, Petroleum Navigator

Potential for In-Region Production of Low Carbon Fuels

- The Northeast and Mid-Atlantic states import most fossil fuels, and are price-takers on world markets;
- Volatility of fuel prices imposes significant costs on the regional economy;
- The region has significant biomass resources and substantial R&D in developing fuel technologies (e.g., advanced biofuels, gasification, PHEV batteries);
- Production of low carbon fuels within the region has the potential to create regional economic benefits while reducing fuel imports and increasing energy security.

Regional Feedstocks

- **Municipal Solid Waste**
 - Only items that have reached the end of their use cycle (non-reusable, non-recyclable)
 - The Northeast's most significant potential resource
 - Less likely to induce additional LUC than virgin feedstocks
- **Woody Biomass**
 - New England has substantial woody biomass but also many existing markets (e.g., pulp and paper, exports)
 - NY and PA combine for approximately two-thirds of available supply
- **Agricultural Residues**
 - New York and Pennsylvania dominate again, approximately 75 to 90 percent of agricultural biomass resources

Estimated Biomass in 2010

Biomass Category		Units	Biomass Quantity
Waste-Based Biomass	MSW (Yard Waste, Paper, Food Scraps, Wood)	tons	20 million
	WWTF and Livestock Waste		6 million
	WWTF Biogas	cubic feet	28 million
Woody Biomass		tons	5-6 million



State	Dry Ton Equivalent
Connecticut	1,100,000
Massachusetts	1,700,000
Rhode Island	190,000
Vermont	2,500,000
Maine	2,300,000
New Hampshire	2,800,000
New York	13,000,000
New Jersey	2,000,000
Pennsylvania	12,000,000

Maximum Woody Biomass is 33 to 37 million dry tons; we conservatively estimate “likely availability” to be 5 to 6 million dry tons.

Potential Regional Production of Low Carbon Fuels, 2010 and 2020

Low-Carbon Fuel	2020 Regional Production	Energy-equivalent volume gasoline or diesel (Mgal)
Electricity from Biomass	1500 MW	1100
Cellulosic Ethanol	440 Mgal	290
Thermal Energy	1,000,000 Homes	630
Biodiesel	8.5 Mgal	7.8

2020 projected business-as-usual demand in 11-state region:

32 Bgal gasoline

15 Bgal distillate

Current Status

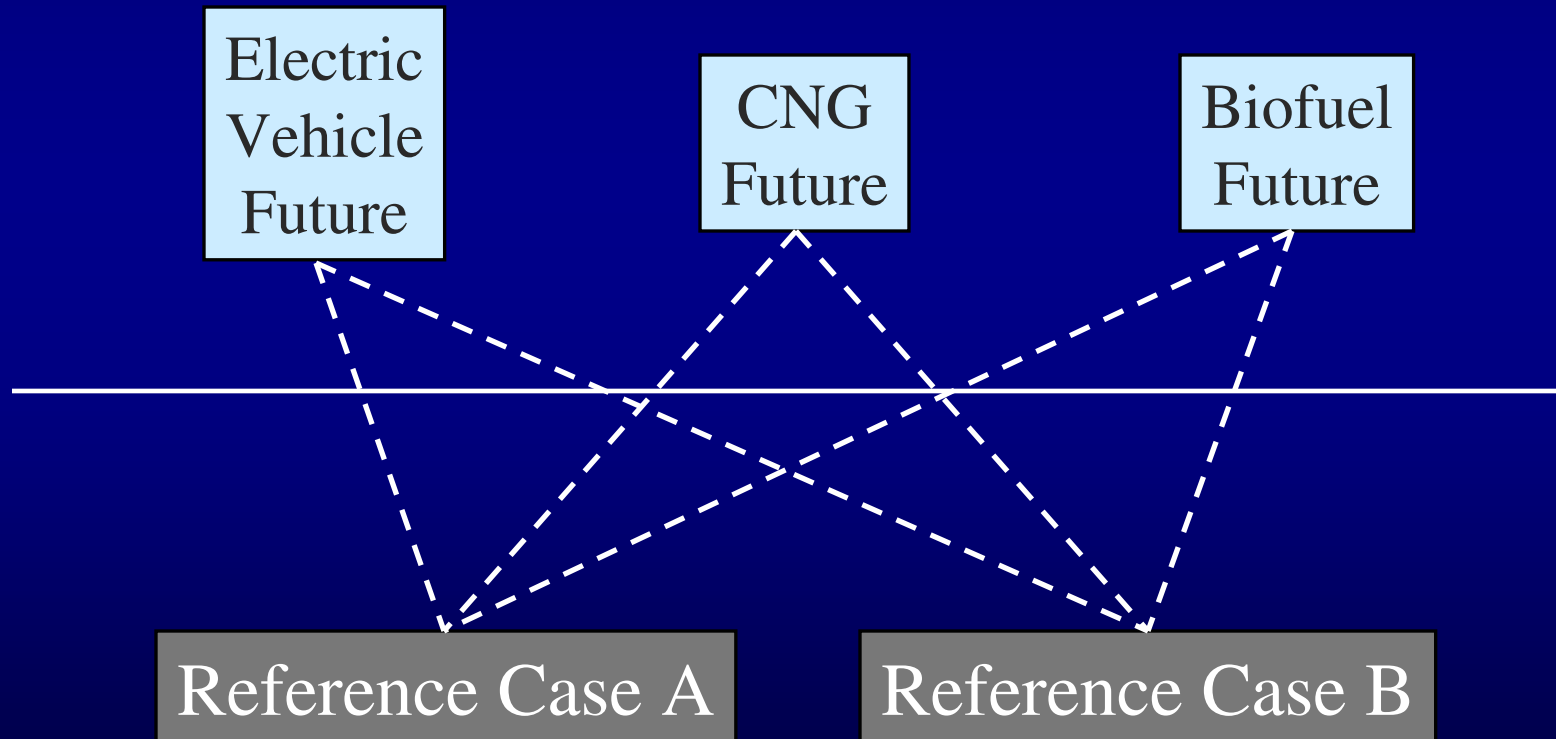
- **Performing economic analysis per Governors' Memorandum of Understanding, December 2009**
 - Available online at <http://www.nescaum.org/topics/low-carbon-fuels>
- **State and regional data collection:**
 - Petroleum, natural gas, and electric infrastructure
 - Biofuels availability and potential for regional development
 - Economic conditions, employment, industry status
 - Future fuel price and volume projections to inform analysis of economic impacts

Current Status

- **Economic analysis design:**
 - “Boundary” analysis
 - Sensitivity analyses
 - Preliminary Regional Economic Models (REM) results early fall for state and stakeholder review
- **Regulated entities, compliance and enforcement:**
 - Options for point of regulation
 - Developing a credit-trading structure to control program costs and facilitate regional compliance

Econ Analysis Method: Three Scenarios

Start date for all 3 Policy Cases is 2012. Timeframe is 10 years.



Goals of the Analysis

We have the following goals for the LCFS economic analysis:

- Estimate relative magnitude of potential costs and benefits resulting from LCFS implementation
- Generate insights into the outcomes of various policy options
- Identify key issues for LCFS decision-makers
- Provide stakeholders with opportunities for review and input
- Adhere to “best practices” in regulatory economic analysis

The LCFS Economic Analysis is not intended to:

- Predict future economic conditions or the likelihood of any policy outcome
- Limit possible policy options available to decision-makers

Stakeholder involvement 2009-2010

- Ten individual meetings and two regional meetings with stakeholders in 2009
- 2010 so far: stakeholder webinars and industry-specific meetings to discuss:
 - Economic analysis inputs
 - Sustainability concerns
 - Program framework
- Two rounds of stakeholder review of economic data and assumptions
- Process continues throughout 2010

Next Steps and Major Milestones

- 2010:
 - June: Finish stakeholder data review, 2nd round of economic analysis input parameters
 - July-August-September: Run economic analysis, develop sustainability and framework elements
 - September-October: Review economic modeling, discuss framework and sustainability options, engage stakeholders on model results
 - November-December: Refine recommendations with stakeholder input
- Early 2011: Recommendations to Commissioners, Governors

Thank You

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For more information:

www.nescaum.org